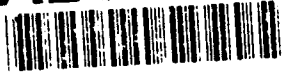


AD-A246 015

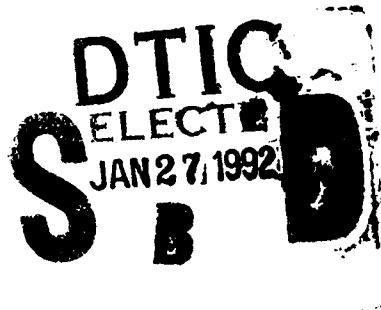
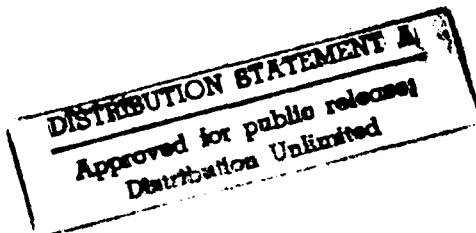


Final Report

JUNE 1990

REPORT NO. EVT 26-89

RAIL IMPACT AND TIEDOWN TESTS
OF THE
M373A2 ELECTRONIC VAN
SEMITRAILER



Prepared for:

Distribution Unlimited

U.S. Army Tank-Automotive Command

ATTN: AMSTA-VEC

Warren, MI 48397-5000

92-01827



92 1 22 061

VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639

U.S. ARMY
ARMAMENT
MUNITIONS
CHEMICAL COMMAND

U.S. ARMY DEFENSE AMMUNITION
CENTER AND SCHOOL



AVAILABILITY NOTICE

A copy of this report is furnished each attendee on automatic distribution. Additional copies or authority for reprinting may be obtained by written request from Director, U.S. Army Defense Ammunition Center and School, ATTN: SMCAC-DEV, Savanna, IL 61074-9639.

DISTRIBUTION INSTRUCTIONS

Destroy this report when no longer needed. Do not return.

* * *

Citation of trade names in this report does not constitute an official endorsement.

* * *

The information contained herein will not be used for advertising purposes.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT UNLIMITED		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) EVT 26-89			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Defense Ammunition Center and School		6b. OFFICE SYMBOL (If applicable) SMCAC-DEV	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) ATTN: SMCAC-DEV Savanna, IL 61074-9639			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION U.S. Army Tank-Automotive Command		8b. OFFICE SYMBOL (If applicable) AMSTA-VEC	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code) ATTN: AMSTA-VEC Warren, MI 48397-5000			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
11. TITLE (Include Security Classification) Rail Impact and Tiedown Tests of the M373A2 6-Ton Electronic Van Semitrailer					
12. PERSONAL AUTHOR(S) A. C. McIntosh					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1990 June 15	
15. PAGE COUNT					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number) The U.S. Army Defense Ammunition Center and School (USADACS) was tasked by U.S. Army Tank-Automotive Command (TACOM) to rail impact test the M373A2 Electronic Van Semitrailer. In addition to rail impact testing, the six tiedown and four slinging provisions were tested with the loading requirements of MIL-STD-209G, Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment. The railcar tiedown procedure was supplied by TACOM. Rail impacts occurred at 4, 6, 8, and 8 reverse miles per hour (mph). Damage occurred to one of the forward tiedown fittings next to the king pin. As a result of this failure, the tiedown procedure was changed to omit this tiedown point and retested on 19 September 1989. As a result of this test, no damage occurred to the tiedown fittings. One-half-inch tiedown cables or flatcar pockets were used in securing the tiedown cables. The tiedown procedure required the use of axle stands. (Continued on back.)					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL Thomas J. Michels			22b. TELEPHONE (Include Area Code) 815-273-8929		22c. OFFICE SYMBOL SMCAC-DEV

19. ABSTRACT (continued)

The M373A2 Electronic Van Semitrailer has four slinging provisions. Five of the slinging points were loaded vertically upward to 18,500 pounds. The load was applied for a period of not less than 90 seconds. All tested provisions remained intact. Tiedown provisions pull tests consisted of applying a forward and aft tension of 14,000 pounds and a downward pull of 7,140 pounds. Each load was applied for a minimum of 9 seconds.

The M373A2 Electronic Van Semitrailer passed the rail impact and the pull tests of the tiedown and slinging provisions. An exception was taken to the style of tiedown and slinging provisions in that they do not follow the guidelines of MIL-STD-209G.



Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
Validation Engineering Division
Savanna, IL 61074-9639

REPORT NO. EVT 26-89
RAIL IMPACT AND TIEDOWN TESTS OF THE
M373A2 ELECTRONIC VAN SEMITRAILER

TABLE OF CONTENTS

PART	PAGE NO.
1. INTRODUCTION	1-1
A. BACKGROUND	1-1
B. AUTHORITY	1-1
C. OBJECTIVE	1-1
D. CONCLUSIONS	1-1
E. RECOMMENDATIONS	1-2
2. ATTENDEES	2-1
3. TEST PROCEDURES	3-1
4. TEST SPECIMEN & RESULTS	4-1
A. Rail Impact Test	4-1
B. Static Pull Test	4-2
5. TIEDOWN PROCEDURE	5-1
6. PHOTOGRAPHS	6-1

PART 1

GENERAL

A. INTRODUCTION.

The U.S. Army Defense Ammunition Center and School (USADACS) was requested by U.S. Army Tank-Automotive Command (TACOM) to test the M373A2 Electronic Van Semitrailer using the requirements of the American Association of Railroads (AAR) for rail shipment and to test the slinging and tiedown provisions using Military Standard 209G, Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment (MIL-STD-209G). The tiedown procedure used to secure the semitrailer to the flatcar was supplied by TACOM.

B. AUTHORITY.

This test was conducted in accordance with mission responsibilities delegated by U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL. Reference is made to Change 4, 4 October 1974; to AR-740-1, 23 April 1971, Storage and Supply Operations; and, AMCCOM-R 10-17, 13 January 1986, Mission and Major Functions of USADACS.

C. OBJECTIVE.

The objective of these tests was to determine if the M373A2 Electronic Van Semitrailer would satisfy the AAR rail transportation requirements and MIL-STD-209G provisions for pull tests.

D. CONCLUSIONS.

1. The M373A2 Electronic Van Semitrailer satisfied the AAR and MIL-STD-209G test requirements. An exception was taken to the style and placement of slinging and tiedown provisions in that they do not conform to the guidelines of MIL-STD-209G.

2. The present location of the tiedown provisions, recessed under the semitrailer, was not designed to aid in attaching 1/2-inch tiedowns between the semitrailer and flatcar pockets. The tiedowns presented a rectangular area for attachment which precluded the use of cable thimbles. Also, this type of tiedown attachment does not conform to the guidelines of MIL-STD-209G.

E. RECOMMENDATIONS.

It is recommended that the M373A2 Electronic Van Semitrailer be approved for rail transportation in accordance with the supplied tiedown procedure.

PART 2

**M373A2 6-TON ELECTRONIC VAN SEMITRAILER RAIL IMPACT AND
TIEDOWN TESTS**

8-10 AUGUST 1989

TEST ATTENDEES

NAME AND PHONE NUMBER

ORGANIZATION

**A.C. McIntosh
Test Engineer
DSN 585-8989
815-273-8989**

**U.S. Army Defense Ammunition Center
and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639**

**Quinn Hartman
General Engineer
DSN 585-8992
815-273-8992**

**U.S. Army Defense Ammunition Center
and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639**

**David Valant
Electronic Technician
DSN 585-8988
815-273-8988**

**U.S. Army Defense Ammunition Center
and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639**

**Jeffery M. Wilkins
DSN 786-6564
313-574-6564**

**U.S. Army Tank-Automotive Command
ATTN: AMSTA-VEC
Warren, MI 48397-5000**

**Dianne M. Miller
DSN 786-7484
313-574-7484**

**U.S. Army Tank-Automotive Command
ATTN: AMSTA-QWM
Warren, MI 48397-5000**

**Mark R. Fischer
813-748-3900
Ext. 228**

**Miller Trailers, Inc.
3709 67th. Street West
Bradenton, FL**

PART 3

TEST PROCEDURES

A. RAIL IMPACT TEST.

The test load or vehicle should be positioned in/on a railcar. For containers, the loaded container shall be positioned on a container chassis and securely locked in place using the twist locks at each corner. The container chassis shall be secured to a railcar. Equipment needed to perform the test includes the specimen (hammer) car, five empty railcars connected together to serve as the anvil, and a railroad locomotive. These anvil cars are positioned on a level section of track with air and hand brakes set and with the draft gear compressed. The locomotive unit pulls the specimen car several hundred yards away from the anvil cars, then pushes the specimen car toward the anvil at a predetermined speed, and disconnects from the specimen car about 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it strikes the anvil. This constitutes an impact. Impacting is accomplished at speeds of 4, 6, and 8 mph in one direction and at a speed of 8 mph in the opposite direction. The 4 and 6 mph impact speeds are approximate; the 8 mph speed is a minimum. Impact speeds are to be determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars.

B. SECURING PROVISION TESTS.

The securing provision tests were extracted from MIL-STD-209G as follows:

1. Tiedown provisions. The tiedown provision tests are based on paragraphs 5.1.2 (Class 2 Tiedown Provisions) and 5.5.3 (Tiedown Provisions). Class 2 provisions shall withstand 4.0 times the Maximum Shipping Weight (MSW) in the forward and aft direction of the longitudinal axis of the equipment, 2.0 times the the MSW in the downward direction of the vertical axis, and

1.5 times the MSW in each direction of the lateral axis. The force applied to each provision shall be its proportionate share of the MSW. Each load shall be maintained for a period of not less than 9 seconds. A suitable measuring device (dynamometer or load cell) shall be placed between the provision and the applied force.

2. Sliding provisions. The basis for the sliding tests are paragraphs 5.1.1.2 (for equipment with the MSW of 25,000 pounds or more) and 5.2.2 (Sliding Provisions). The MSW of the XM1063 ASL Van is 40,000 pounds. A design load of 2.3 times the working load of each provision is required. The test load is applied to the lifting provision for a period of 90 seconds. A suitable measuring device (dynamometers or load cell) shall be placed between the provision and the applied force.

PART 4

TEST RESULTS

A. RAIL IMPACT TEST

DATE: 10 August 1989

TEST SPECIMEN: M373A2 SEMITRAILER ON FLATCAR

TEST FLATCAR NO: BN 606791

LT. WT.: 51,500 pounds

LADING & DUNNAGE

WT.: 21,400 pounds

TOTAL SPECIMEN WT.: 72,900 pounds

BUFFER CAR (5 CARS) WT.: 250,000 pounds

IMPACT NO.	END STRUCK	VELOCITY	REMARKS
1	Forward	4.93 mph	Forward tiedown ring cracked.
2	Forward	6.85 mph	Forward tiedown ring separated.
3	Forward	8.71 mph	Both tiedown rings cracked. Separation increased.
4	Reverse	8.81 mph	Load shifted and end cleats popped out at stanchion.

PART 4

TEST RESULTS

B. STATIC PULL TESTS.

1. Tiedown Provisions.

MSW = 40,000 pounds

Number of Provisions = 10

Provision Load Share = 4,000 pounds

DIRECTION	TEST FACTOR	APPLIED LOAD
Longitudinal	4.0	16,000 pounds
Vertical Down	2.0	8,000 pounds
Lateral	1.5	6,000 pounds

Longitudinal and lateral loads were applied to all provisions. Vertical loads were not applied to the provisions above the rear trailer wheels. All loads remained applied for six seconds or longer. No damage on any provisions was observed.

2. Slings Provisions.

MSW = 40,000 pounds

Number of Provisions = 4

Provision Load Share = 10,000 pounds

DIRECTION	TEST FACTOR	APPLIED LOAD
Vertical	2.3	23,000 pounds

The XM1063 ASL 102-Inch-Wide Semitrailer has six slinging provisions. In normal slinging situations only four are used. Vertical loading was applied to all slinging provisions. MIL-STD-209G requires a load factor of 3.2 to be applied at an angle of 45 degrees to the provision. This test was not accomplished due to the lack of equipment heavy enough to achieve the required load.

RESULTS FROM RAIL IMPACT TESTING OF
M373A2 SEMITRAILER ON FLATCAR
DATE: 10 AUGUST 1989

TAPE CHANNEL 1 : LONGITUDINAL ACCELERATION ON SILL

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.93	1.04	32.25	.0257
IMPACT 2	6.85	1.63	44.45	.0413
IMPACT 3	8.71	2.27	53.53	.0747
IMPACT 4 (REVERSE)	8.81	-2.15	36.61	.0607

TAPE CHANNEL 2 : VERTICAL ACCELERATION ON SILL

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.93	.40	18.58	.0043
IMPACT 2	6.85	.73	34.44	.0146
IMPACT 3	8.71	1.12	51.35	.0259
IMPACT 4 (REVERSE)	8.81	.47	31.02	.0091

TAPE CHANNEL 3 : LONGITUDINAL ACCELERATION RIGHTSIDE OF 5TH WHEEL

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.93	5.66	*****	*****
IMPACT 2	6.85	-14.70	65.36	.6060
IMPACT 3	8.71	-18.34	63.62	.6727
IMPACT 4 (REVERSE)	8.81	5.05	141.25	.4688

TAPE CHANNEL 4 : LONGITUDINAL ACCELERATION ON LEFTSIDE 5TH WHEEL

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.93	1.22	116.26	.1040
IMPACT 2	6.85	1.69	48.62	.0563
IMPACT 3	8.71	2.56	51.51	.0892
IMPACT 4 (REVERSE)	8.81	-1.67	73.06	.0931

TAPE CHANNEL 5 : RAIL COUPLER FORCE

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE POUNDS</u>	<u>DURATION MILLISECONDS</u>	<u>AREA POUNDS-SECONDS</u>
IMPACT 1	4.93	135841.38	324.50	11601.10
IMPACT 2	6.85	148798.23	64.74	6197.57
IMPACT 3	8.71	175300.83	69.46	9144.14
IMPACT 4 (REVERSE)	8.81	212675.33	69.98	11250.30

TAPE CHANNEL 6 : LONGITUDINAL ACCELERATION ON LEFT SIDE FRAME
(FRONT)

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE G'S</u>	<u>DURATION MILLISECONDS</u>	<u>AREA G'S-SECONDS</u>
IMPACT 1	4.93	1.25	124.20	.0988
IMPACT 2	6.85	.44	45.03	.0114
IMPACT 3	8.71	.51	31.42	.0101
IMPACT 4 (REVERSE)	8.81	-.45	44.02	.0125

TAPE CHANNEL 7 : LONGITUDINAL ACCELERATION ON LEFT SIDE FRAME
(MIDDLE)

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE G'S</u>	<u>DURATION MILLISECONDS</u>	<u>AREA G'S-SECONDS</u>
IMPACT 1	4.93	1.10	85.07	.0711
IMPACT 2	6.85	1.60	46.33	.0480
IMPACT 3	8.71	2.25	44.39	.0628
IMPACT 4 (REVERSE)	8.81	-1.48	67.69	.0761

TAPE CHANNEL 8 : LONGITUDINAL ACCELERATION ON TRAILER REAR

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE G'S</u>	<u>DURATION MILLISECONDS</u>	<u>AREA G'S-SECONDS</u>
IMPACT 1	4.93	1.13	185.20	.0692
IMPACT 2	6.85	1.62	44.63	.0466
IMPACT 3	8.71	2.29	43.11	.0653
IMPACT 4 (REVERSE)	8.81	-1.46	73.19	.0827

NOTES:

*****: DATA NOT AVAILABLE.

PART 4

TEST RESULTS

A. RAIL IMPACT TEST

DATE: 19 September 1989

TEST SPECIMEN: M373A2 SEMITRAILER ON FLATCAR

TEST FLATCAR NO: BN 606769

LT. WT.: 56,800 pounds

LADING & DUNNAGE

WT.: 21,400 pounds

TOTAL SPECIMEN WT.: 78,200 pounds

BUFFER CAR (5 CARS) WT.: 250,000 pounds

IMPACT NO.	END STRUCK	VELOCITY	REMARKS
1	Forward	4.95 mph	Semitrailer moved forward 1/4 inch on stanchion.
2	Forward	6.12 mph	Semitrailer shifted right 1/2 inch.
3	Forward	8.09 mph	No movement on stanchion.
4	Reverse	8.15 mph	No movement or damage to the semitrailer, load or tie-downs.

RESULTS FROM THE RAIL IMPACT TEST OF ELECTRONIC
VAN ON FLATCAR
DATE: 19 SEPTEMBER 1989

TAPE CHANNEL 1 : LONGITUDINAL ACCELERATION ON SILL

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.95	-2.22	26.30	.0400
IMPACT 2	6.12	-2.39	58.93	.0918
IMPACT 3	8.09	-3.47	53.13	.1152
IMPACT 4 (REVERSE)	8.15	3.12	34.76	.0726

TAPE CHANNEL 2 : VERTICAL ACCELERATION ON SILL

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.95	-.32	24.78	.0059
IMPACT 2	6.12	-.50	72.42	.0089
IMPACT 3	8.09	-.56	44.93	.0153
IMPACT 4 (REVERSE)	8.15	-.84	28.04	.0175

TAPE CHANNEL 3 : LONGITUDINAL ACCELERATION ON RIGHT SIDE OF 5TH
WHEEL

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.95	-1.65	138.48	.1677
IMPACT 2	6.12	-2.24	62.97	.0877
IMPACT 3	8.09	-2.31	77.59	.1284
IMPACT 4 (REVERSE)	8.15	2.67	126.44	.2637

TAPE CHANNEL 4 : LONGITUDINAL ACCELERATION LEFT SIDE FRAME FRONT

<u>TEST</u>	<u>SPEED</u> <u>MPH</u>	<u>PEAK VALUE</u> <u>G'S</u>	<u>DURATION</u> <u>MILLISECONDS</u>	<u>AREA</u> <u>G'S-SECONDS</u>
IMPACT 1	4.95	-1.54	221.66	.1979
IMPACT 2	6.12	-2.06	70.20	.0903
IMPACT 3	8.09	-1.79	72.93	.0942
IMPACT 4 (REVERSE)	8.15	2.54	119.97	.2452

TAPE CHANNEL 5 : RAIL COUPLER FORCE

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE POUNDS</u>	<u>DURATION MILLISECONDS</u>	<u>AREA POUNDS-SECONDS</u>
IMPACT 1	4.95	137492.41	565.68	14452.45
IMPACT 2	6.12	160413.13	91.69	8810.87
IMPACT 3	8.09	186767.58	78.75	10083.52
IMPACT 4 (REVERSE)	8.15	228425.61	61.34	10558.46

TAPE CHANNEL 6 : LONGITUDINAL ACCELERATION ON LEFT SIDE 5TH WHEEL

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE G'S</u>	<u>DURATION MILLISECONDS</u>	<u>AREA G'S-SECONDS</u>
IMPACT 1	4.95	-1.61	154.70	.1362
IMPACT 2	6.12	-2.23	65.13	.0908
IMPACT 3	8.09	-1.12	465.40	.2176
IMPACT 4 (REVERSE)	8.15	2.47	145.66	.2105

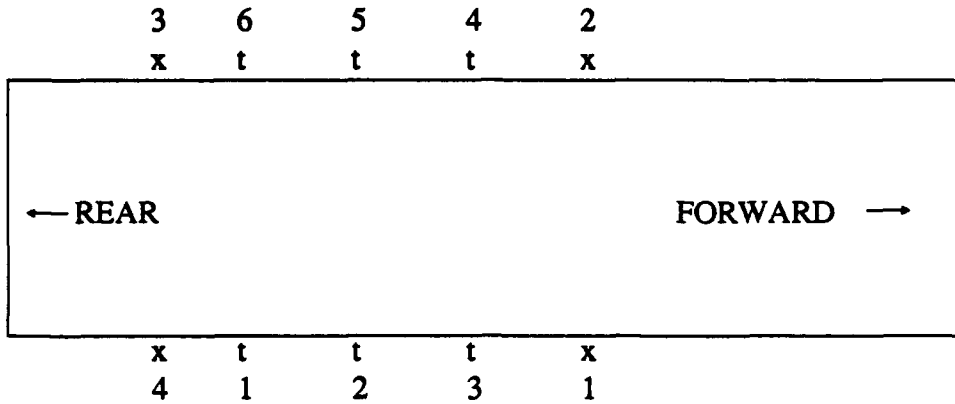
TAPE CHANNEL 7 : LONGITUDINAL ACCELERATION ON LEFT SIDE FRAME
MIDDLE

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE G'S</u>	<u>DURATION MILLISECONDS</u>	<u>AREA G'S-SECONDS</u>
IMPACT 1	4.95	-1.66	325.79	.1936
IMPACT 2	6.12	-2.25	68.35	.0939
IMPACT 3	8.09	-2.17	77.84	.1242
IMPACT 4 (REVERSE)	8.15	2.65	111.98	.2119

TAPE CHANNEL 8 : LONGITUDINAL ACCELERATION ON REAR OF TRAILER

<u>TEST</u>	<u>SPEED MPH</u>	<u>PEAK VALUE G'S</u>	<u>DURATION MILLISECONDS</u>	<u>AREA G'S-SECONDS</u>
IMPACT 1	4.95	-1.57	303.15	.1939
IMPACT 2	6.12	-2.14	91.80	.0967
IMPACT 3	8.09	-2.08	100.44	.1553
IMPACT 4 (REVERSE)	8.15	2.58	198.53	.1940

RESULTS OF PULL TESTS



Legend: x=Slinging provision

t=tiedown provision

SLINGING PROVISION TEST RESULTS

Provision	Pull
1	18,000
2	16,500
3	19,200
4	19,000

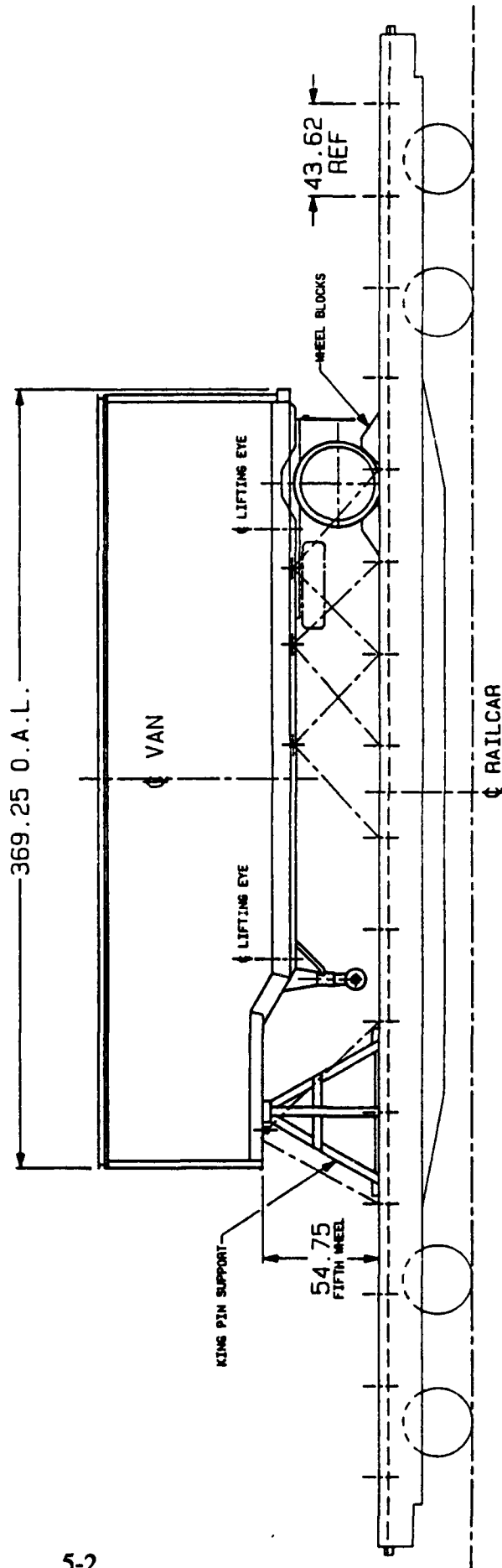
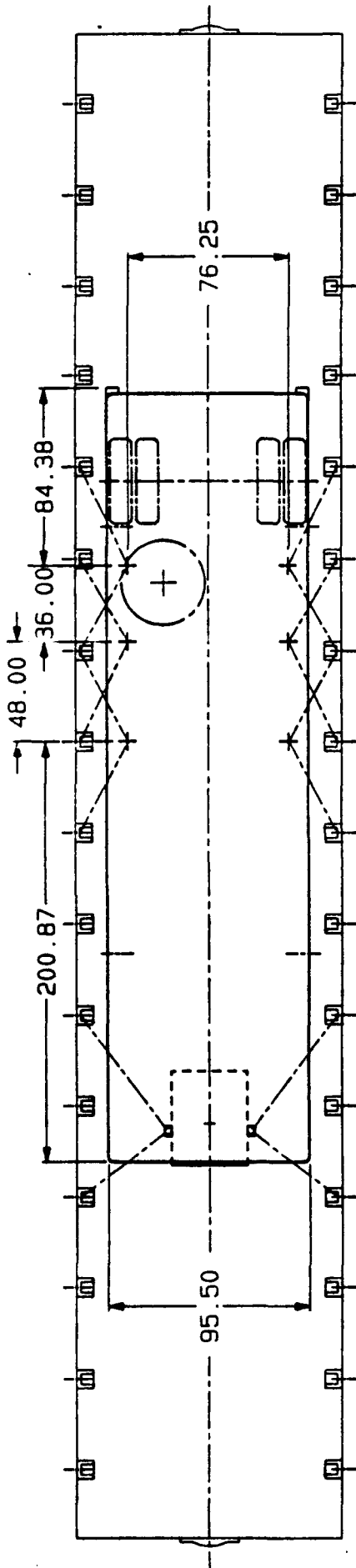
TIEDOWN PROVISION TEST RESULTS

Provision	Lateral	Vertical	Longitudinal	
			Forward	Rear
1	12,000	8,000	15,000	14,000
2	11,000	8,000	15,300	14,500
3	12,000	7,500	15,500	15,000
4	12,000	8,000	12,500	15,000
5	10,500	7,500	15,000	15,000
6	12,000	8,000	15,000	15,000

NOTE: All loads are measured in pounds.

PART 5

TIEDOWN PROCEDURE



M373 VAN ON FLATCAR
SCALE: 1/50

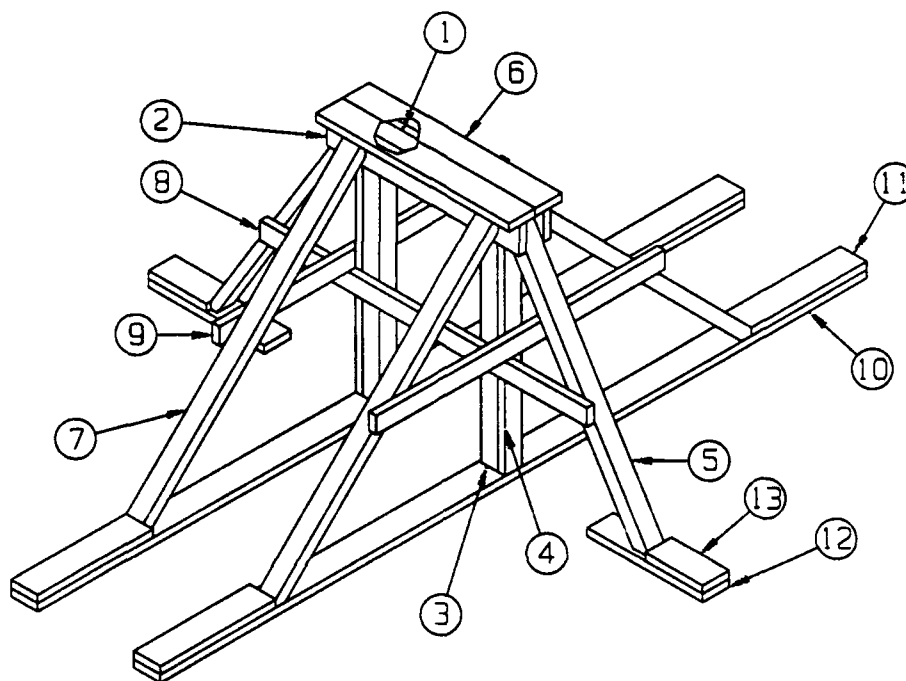
DRAWN BY M. FISCHER

----- TEST DRAWING -----
NOT TO BE USED AS AN OUTLOADING/
UNITIZATION/STANDARD PROCEDURE

FOR INFORMATION ONLY

DRAFTSMAN	TITLE	M373A2 6-TON ELECTRONIC VAN TRAILER (2nd TEST)			
S. VON THUN					
TEST ENGINEER	DATE				
A. McINTOSH					
CHIEF, VALIDATION ENGINEERING DIVISION	DWG NO	DATE			
J. KROHN	89-026-0-T00035	SEPTEMBER 1989			

M373A2 6-TON ELECTRONIC VAN TRAILER



STANCHION TYPE IX

SAFE WORKING LOAD - 13,000 LBS (CONCENTRATED ON CAP (6) AT 2 POINTS,
DIRECTLY ABOVE A VERTICAL LEG (3)).
4,200 LBS (DISTRIBUTED EQUALLY ON CAP (6)).
2,100 LBS (CONCENTRATED ON CAP (6) AT ONE POINT
CENTERED BETWEEN LEGS (3)).

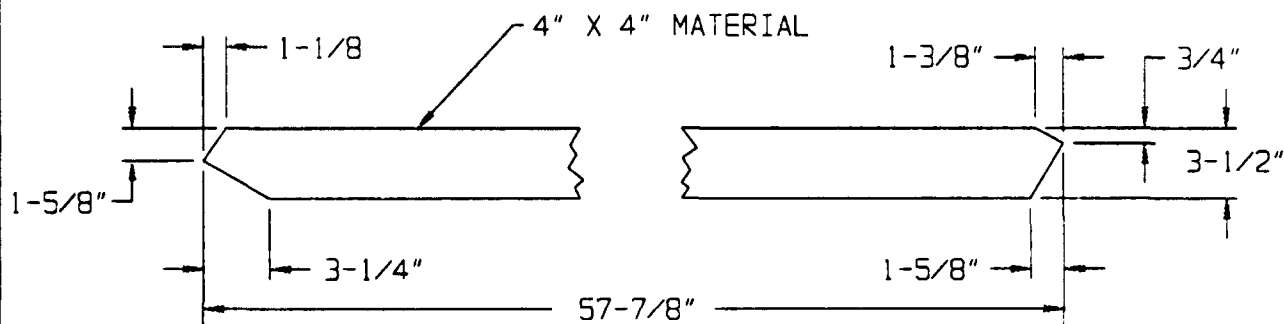
FOR INFORMATION ONLY

TITLE M373A2 6-TON ELECTRONIC VAN TRAILER (2nd TEST)	DWG NO 89-026-0-T00036 VALIDATION ENGINEERING DIVISION SHEET 2 OF 5
---------------------------------------------------------------	------------------------------------------------------------------------------

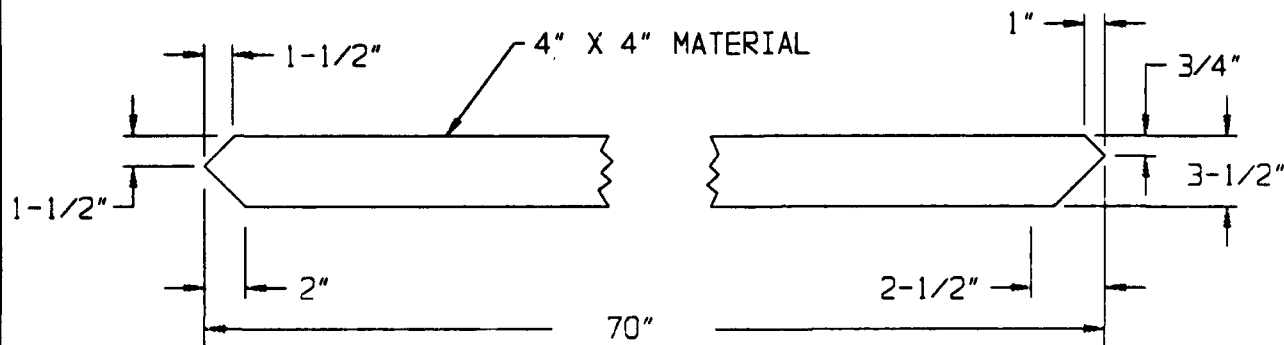
M373A2 6-TON ELECTRONIC VAN TRAILER

NOTE: THE LENGTHS SPECIFIED FOR ③, ④, ⑤, ⑦, AND ⑩, ARE BASED ON AN ASSEMBLY HEIGHT OF 52". FOR EACH ONE INCH 1" VARIATION IN THE ASSEMBLY HEIGHT, THE SPECIFIED OVERALL LENGTHS OF THESE PIECES WILL BE ADJUSTED AS FOLLOWS:

KEY NUMBER	ADJUSTMENT
③	1"
④	1"
⑤	1-1/8"
⑦	1-1/2"
⑩	2"



DETAIL PIECE ⑤



DETAIL PIECE ⑦

FOR INFORMATION ONLY

TITLE	89-026-0-T00039
M373A2 6-TON ELECTRONIC VAN TRAILER (2nd TEST)	89-026-0-T00039
	VALIDATION ENGINEERING DIVISION
	SHEET 5 OF 5

M373A2 6-TON ELECTRONIC VAN TRAILER

KEY NUMBERS

- ① 4" X 4" X 28" (1 REQD).
- ② 2" X 6" X 40" (2 REQD). NAIL TO ① W/4-12d NAILS.
NAIL TO ③ AND ⑤ W/2-12d NAILS EACH.
- ③ 4" X 4" X 45-1/2" (2 REQD). TOENAIL TO ① AND ⑩ W/4-16d
NAILS EACH END.
- ④ 2" X 4" X 49" (2 REQD). NAIL TO ① W/2-12d NAILS AND TO ③
W/5-12d NAILS.
- ⑤ 4" X 4" X 57-7/8" (2 REQD). DOUBLE BEVEL EACH END. SEE "DETAIL
PIECE ⑤ " ON SHEET 5 FOR BEVEL CUTS REQUIRED. TOENAIL TO ④
W/2-16d NAILS. NAIL TO ⑫ W/3-16d NAILS AFTER ASSEMBLY
(① THRU ⑩) HAS BEEN LOCATED ON CAR AND ⑫ HAS BEEN
NAILED TO CAR FLOOR.
- ⑥ 2" X 6" X 40" (2 REQD). NAIL TO ① AND ② W/5-12d NAILS EACH
AND TO ⑤ AND ⑦ W/2-12d NAILS EACH JOINT.
- ⑦ 4" X 4" X 70" (4 REQD). DOUBLE BEVEL EACH END. SEE "DETAIL
PIECE ⑦ " ON SHEET 5 FOR BEVEL CUTS REQUIRED. TOENAIL TO ②
W/4-16d NAILS. TOENAIL TO ⑩ W/3-16d NAILS BEFORE ASSEMBLY
(① THRU ⑩) HAS BEEN LOCATED UNDER ITEM AND ⑩ HAS BEEN
NAILED TO CAR FLOOR.
- ⑧ 2" X 4" X 68" (1 REQD). NAIL TO ③ AND ⑤ W/3-12d NAILS
EACH JOINT.
- ⑨ 2" X 4" X 60" (2 REQD). NAIL TO ④ AND ⑦ W/3-12d NAILS
EACH JOINT.

FOR INFORMATION ONLY

TITLE M373A2 6-TON ELECTRONIC VAN TRAILER (2nd TEST)	DWG NO 89-026-0-T00037 VALIDATION ENGINEERING DIVISION SHEET 3 OF 5
----------------------------------------------------------------------	----------------------------------------------------------------------------------------

M373A2 6-TON ELECTRONIC VAN TRAILER

KEY NUMBERS

- ⑩ 2" X 6" X 12'-3" (2 REQD). NAIL TO CAR FLOOR W/1-30d NAIL EVERY 8".
- ⑪ 2" X 6" X 24" (4 REQD). POSITION AGAINST ⑦ AND NAIL TO ⑩ W/5-30d NAILS.
- ⑫ 2" X 6" X 24" (2 REQD). NAIL TO CAR FLOOR W/5-30d NAILS.
- ⑬ 2" X 6" X 12" (2 REQD). POSITION AGAINST ⑤ AND NAIL TO ⑫ W/4-30d NAILS.

FOR INFORMATION ONLY

TITLE M373A2 6-TON ELECTRONIC VAN TRAILER (2nd TEST)	OWG NO 89-026-0-T00038 VALIDATION ENGINEERING DIVISION
SHEET 4 OF 5	

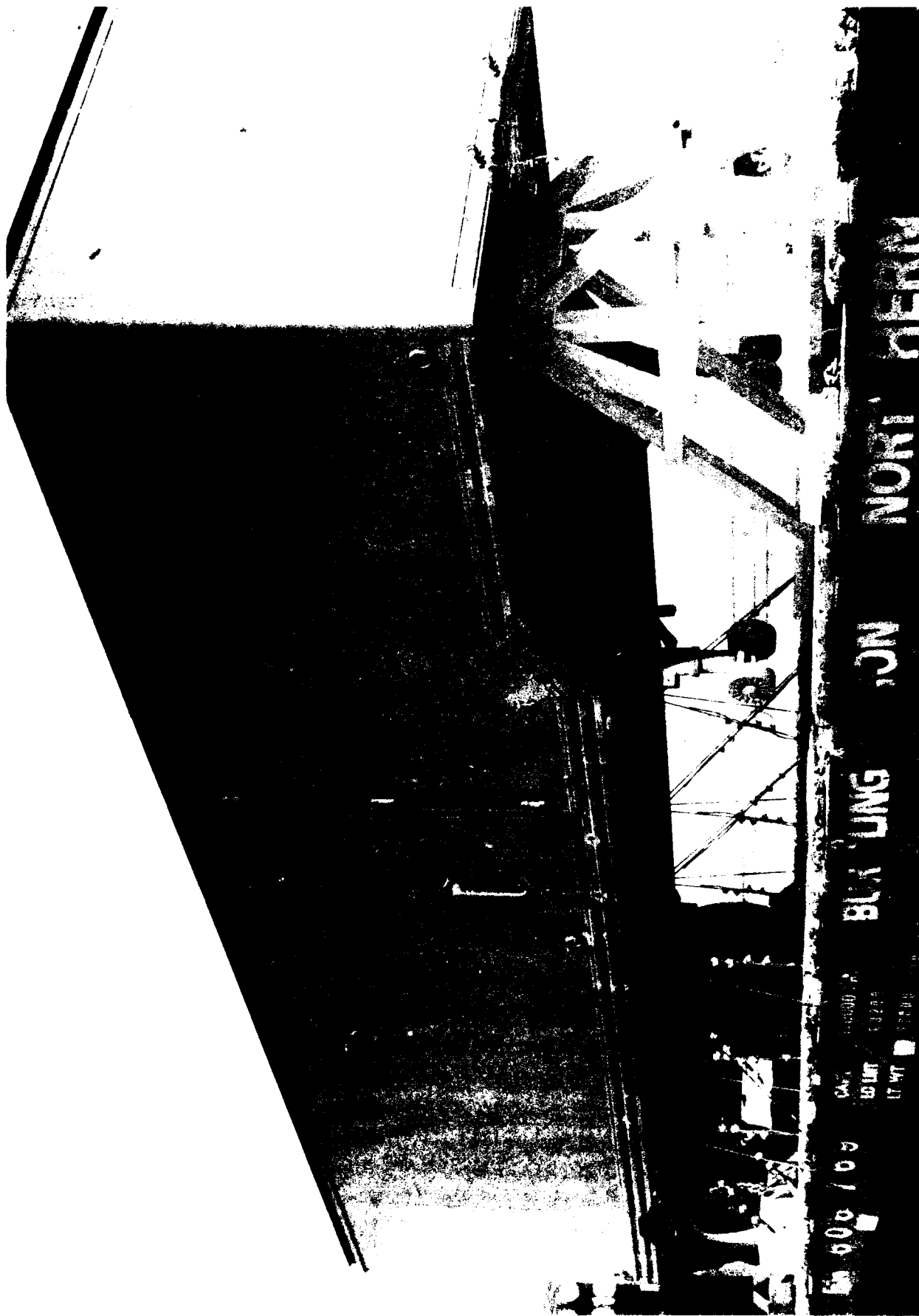
PART 6

PHOTOGRAPHS



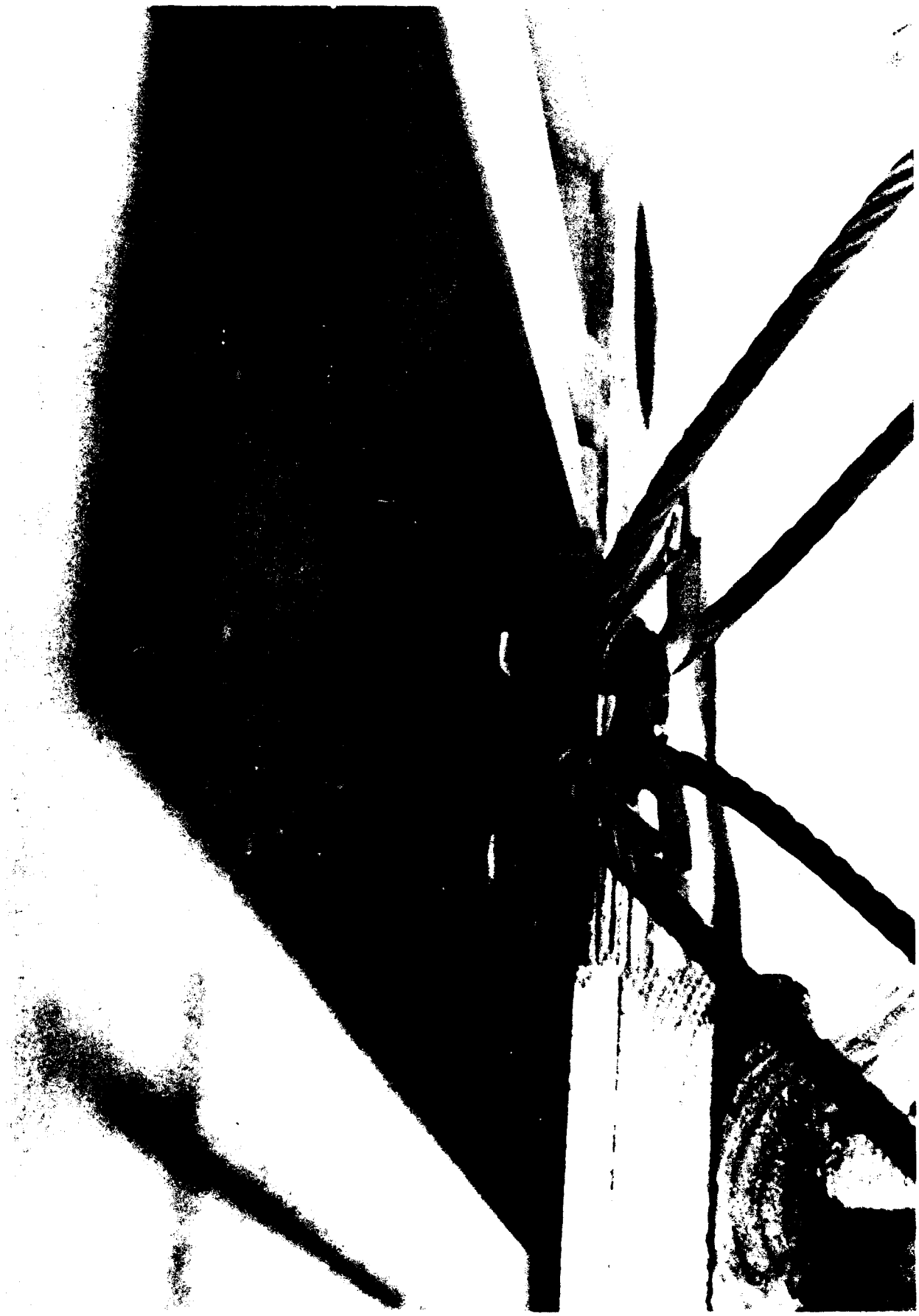
	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
--	--------------------------------------------------------------	--

Photo No. A0317-SPN-89-5332-12. This photo shows the M373A2 Electronic Van Semitrailer resting on the transportation stanchion. The forward tiedown provisions were not used in the second set of impact tests.



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. A0317-SPN-89-5307-2. This photo shows the M373A2 Electronic Van Semitrailer tied down for the second set of rail impact tests. The four forward tiedown cables were omitted for this test.



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. A0317-SPN-89-989-4509. This photo shows the split tiedown provisions on the M373A2 Electronic Van Semitrailer after impact. These provisions failed impact testing by cracking and partially separating.



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. A0317-SPN-89-989-4513. This photo shows eight cables to tie down the M373A2 Electronic Van Semitrailer on one side of the flatcar. There is an identical number of tie-downs on the opposite side of the trailer.